Macroscopic anatomical features of the digestive system in the common buzzard (*Buteo Buteo)*

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Abstract
The study was conducted on 10 bodies of common buzzard (Buteo buteo), from the Association for the Protection of Birds and Nature, MILVUS Group. The bodies were processed according to the dissection protocol established to highlight the macroscopic anatomical features, characteristic of the order in which the studied birds belong. The macroscopic aspect of the esophagus, which is short, distensable, has a well-developed crop, located cranially in the thoraco-abdominal cavity. The glandular stomach and the muscular stomach are poorly developed, joining into the thoracic-abdominal cavity, giving a pear-like appearance. The small intestine is short, divided into the duodenum, jejunum and ileum, and the large intestine has a vestigial, lymphoid type caeca and a short colon. The liver composedof two lobes that join cranially in midline. The right lobe is larger than the left lobe. A well developed gallbladder is located on the ventral side of the right lobe.
Keywords: *Common buzzard, groin, glandular stomach, muscular stomach, ceaca*

Introduction

The morphology of the gastrointestinal tract, metabolic capacity and the physiology of digestion intersected during evolution to match the nutritional needs, depending on the foods available in the natural habitat. (Kirk C. Klasing, 1999) The digestive system is also the largest immunological organ in the body, protecting the bird against exogenous pathogens. (D. Michael Denbow, 2000)

The aim of this study was to supplement the general existing notions, regarding the morphology of the digestive system of the common buzzard (Buteo buteo), highlighting the particularities and how the specific and strictly carnivorous diet, has modified the digestive system in this species. The Common Buzzard (Buteo buteo) is a common bird in our country, being found in both wooded areas and extensive plains.

Materials and methods

The dissections were performed on 10 bird carcasses, all belonging to the family Accipritridae, the genus Buteo, the species Buteo buteo, the Common Buzzard, in the Faculty of Veterinary Medicine, the discipline of Comparative Anatomy.

The birds were brought from the Târgu Mureș, through the kindness of our colleagues from MILVUS Group, Bird and Nature Protection Association. They are birds protected by law (law 49/2007, law 04/2011, law 51/2011 etc.), so there are restrictions regarding interaction with them, but by Directive 2009/147 / EC of the European Parliament and of the Council of November 30, 2009 on the conservation of wild birds, Article 9, point 1 (b), they can be used for research purposes. The birds brought died after accidents (electrocuted, road accident), or were euthanized due to injuries that no longer allowed them to be rehabilitated in the wild.

The body was opened in several stages. The protocol was developed following some passages from the book of Veterinary Necropsic Diagnosis, Cornel Cătoi, 2003, AcademicPres Publishing House.

The plucking of the corpses was carried out strictly in the incision area. At the level of the head, the skin is incised from the level of the lateral commissure of the beak. The incision of the skin continues on the ventral side of the neck, lateral to trachea, up to the level of the cloacal orifice. With scissors, the abdominal muscles are transversely sectioned, at the posterior part of the sternum, posterior to the xiphoid appendix. On each side of the sternum, the initial abdominal incision continues, up to the level of the chondrosteal junctions. The abdominal wall is sectioned longitudinally, up to the bladder and broken laterally. Continue the sectioning with scissors of the chondrostal joints, bilaterally, up to the level of the scapulohumeral joints, the coracoid bones and the clavicle is cut, the sternum is removed, after the pericardial sac is disintegrated. The organs located in the cavity are detached, both commissures of the beak were cut, with the lower jaw detached, together with the esophagus and a portion of the trachea. The skin and the musculature adjacent to the cloacal orifice are cut in order to detach it, together with the digestive tract and the attached organs.

The digestive tract was examined only macroscopically, in situ, and separately from the carcass. It opened, with a scissors, the esophagus, the glandular stomach, the shredding stomach, the small intestine, the large intestine, the cloacal orifice.

A digital camera, Nikon COOLPIX P900, was used to produce the images.

Results and discussions

The beak is strong and curved, includes parts of the upper and lower jaws, the upper jaws are better developed compared to the lower jaws, being covered on the outside by several hard keratin patches, or rhamphotheca. The rhamphotheca is divided in its turn into the rhinotheca, the sheath that covers the maxillary portion, and the gnathotheca, the sheath that covers the jaw. The maxillary rhamphotheca presents at the base a fleshy formation, called ceroma, which represents the boundary between the beak and the frontal part of the head, a formation that also includes the two nostrils. The medial dorsal border of the maxillary rhamphotheca is called culmen, and the ventral median border of the mandibular rhamphotheca is called the gonys.(B. Speer, 2016) The sharp edge of the frame is called the tomia. Birds lack a soft palate and a pharybgeal isthmus; the combined oral and pharyngeal cavities are referred to as the oropharynx.(D. Dendow, 2000, C. Lacasse, 2015) On the hard palace are the choana, longitudinal fissure, which connects the oral and nasal cavities. Infundibular fissure is a common pathway for the ear canal. Palatal ridges, tongue, glottal process show epithelial projections, cornified. The tongue is slightly mobile, on the dorsal surface the papillae are organized in the form of the letter V, with an opening in the aboral sense. (K. Klasing, 1999)(Figure 1)

The laryngeal protuberance presents on the rostral surface the glottis, which represents the entrance to the larynx. Esophagus has two portions: the cervical portion, which is short, and the thoracic portion, which is longer. The crop represents an expansion of the esophagus, present in all raptors, except owls. The raptos crop is fusiform-shaped and has a poorly developed lower sphincter into the thoracic esophagus.(S.Ford, 2010) The esophagus is continued with the proventriculum or the glandular stomach, without a clear demarcation. (Figure 2).

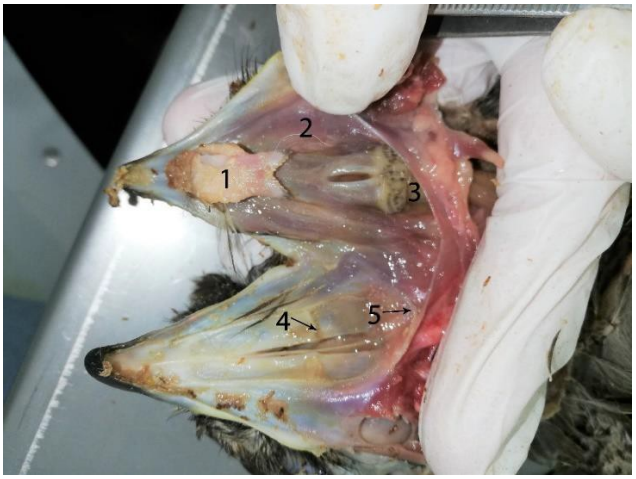

Fig.1 Jaw: 1. Tongue; 2. Laryngeal protuberance with glottal orifice; 3.The esophageal orifice
Maxilla: 4. Choana; 5. Infundibular fissure
The presence of cornified papillae is indicated with the help of arrows

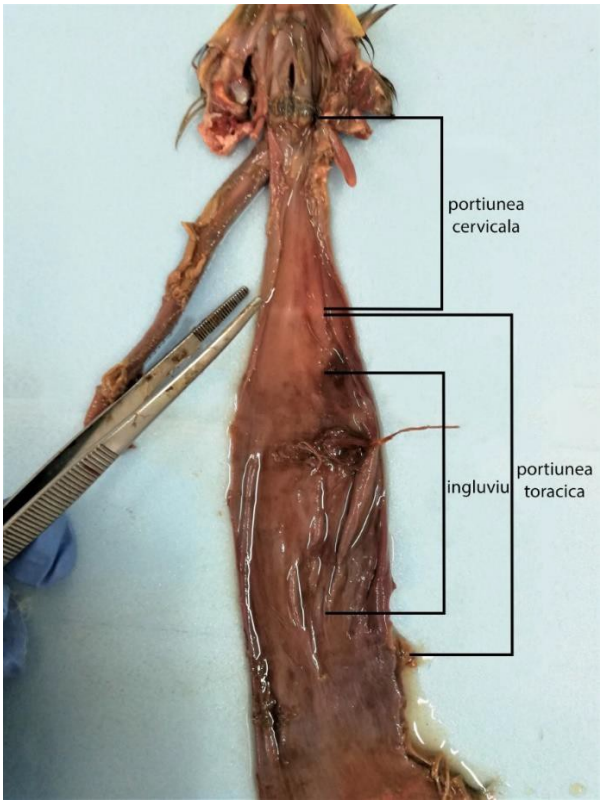

Fig 2. Delimitation of the esophagus and highlighting the groin,
located in the last esophageal segment

The proventriculus or glandular stomach is relatively small in size and is interconnected to the thin wall of the ventriculus or the muscular stomach. (D. Denbow, 2000) The intermediate area between the proventriculus (glandular stomach) and ventriculus (muscular stomach) is dominated by an isthmus.(Figure 3) In addition, the proventriculus and ventriculus form one large pear-shaped cavity. (S.Ford, 2010) Intestinal tract is located in the caudal portion of the thoraco-abdominal cavity, being a compact mass, surrounded by adipose tissue. The posterior portion of the ventricle narrows toward the pyloric region, located on the right side of the organ, 90 ° from the longitudinal axis of the proventricle.(N.Barton,D.Houston,1993) Small intestine is shorter, extending from the level of the pyloric region of the ventricle to the level of the cecum and colon. Duodenal portion is relatively long; there is no obvious crossing between the duodenum and ileum. The demarcation is done according to the anatomical position (M. Murray, 2014, E. Klaphake, J. Clancy, 2005).

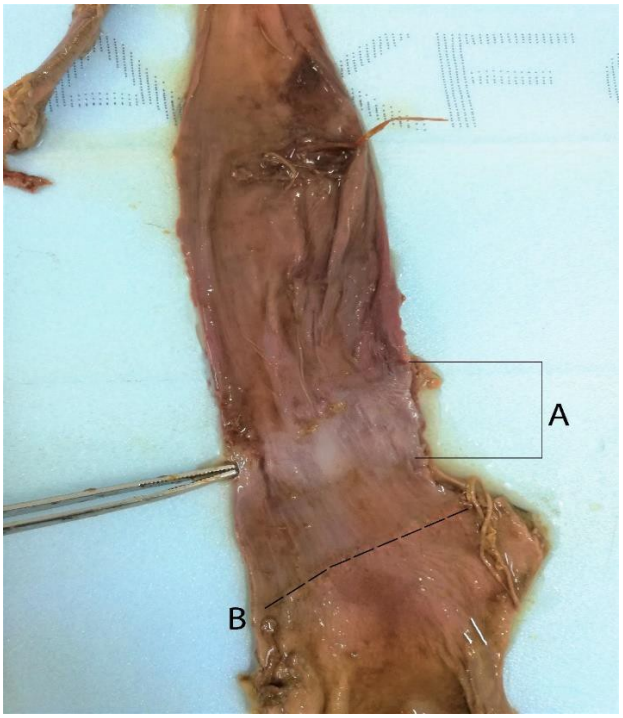

Fig.3 The passage between the glandular or proventric stomach (A) and the shredding or ventricular stomach (B) is dominated by an isthmus (indicated by an arrow).

Colon (sometimes called the rectum) is short, extending from the ileo-cecal junction to the cloaca. Cecum is represented by two rudimentary, vestigial formations. (K.Klasing, 1999) (Figure 4) The birds of the order Accipitriformes, the order that the studied birds belong (the Common Buzzard), are somewhat lymphoid. (Scot Ford, 2010) The cloaca extends from the distal portion of the rectum to the anal orifice.

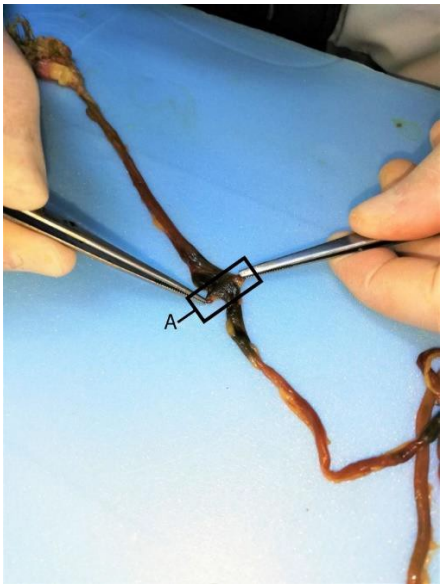

Fig 4.(A) Cecum, represented by the two rudimentary formations, characteristic for the birds of the Accipitriform order

Organs attached to the digestive tract are the liver and pancreas. Pancreas could not be highlighted due to autolysis, the bodies being opened after 3 weeks. Liver is composed of two lobes, which unite cranially, along the midline, extend to the thoracic-andominal cavity and surround the apex of the heart. The right lobe is larger compared to the left lobe. The gallbladder, located on the ventral side of the right lobe, is well developed. (J.Samour, J.Naldo,2007)(Figure 5).

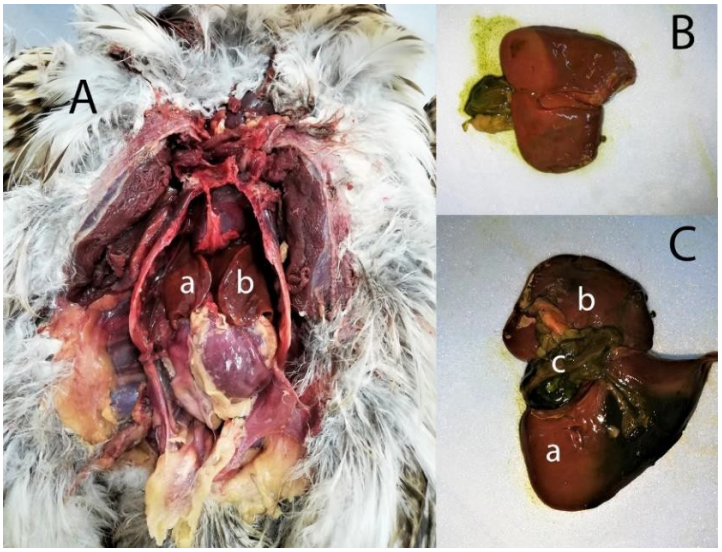

Fig. 5 (A) Liver in the thoracic-abdominal cavity. The two lobes, the right lobe (a) and the left lobe (b) join cranially to the midline, (B) The parietal face of the liver, with the two lobes, the right lobe and the left lobe and the gallbladder, (C) The visceral face of of the liver, with the two lobes, the right lobe (a), visibly better developed in comparison with the left lobe (b), and the gallbladder

Conclusions

1. The digestive system is adapted to the type of food, strictly carnivorous. Birds eating high-protein diets generally have less complicated digestive systems than those eating complex carbohydrates.
2. The beak is strong, curved and jaw muscle well developed, adapted for tearing prey, it was intact when we analysed all corpses. The tongue is less mobile and we could highlight the cornfield papillae on its surface. The soft palate is absent, presenting a single cavity – oropharyngeal cavity.
3. We located the esophagus on the right side of the neck. It can expand in diameter due to the longitudinal fold. The presence of the crop, cranially located in the thoracic cavity, is designed to store ingested food.
4. The glandular and the muscular stomach are underdeveloped in comparison with the non-carnivorous birds, having a pear-like appearance.
5. The small intestine is reduced in size and there is no obvious macroscopic transition between duodenum and ileum.
6. The caeca, located at the junction between ileum and colon, reduced in size, is vestigial.
7. The colon is reduced in size, expanding from the ileocolin junction.
8. The liver is well developed, the right lobe is more developed compared with the left lobe.
9. The gallbladder is well developed, located on the ventral side of the right lobe.

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